

XXV.—On the *Anatomy of the Rhinanthaceæ*, considered in its relations with the classification of these plants. By A. CHATIN*.

It can no longer be doubted that Anatomy can and must intervene in Botany, as it has long done in Zoology, to fix the position of orders, families, genera, and frequently even of species of plants in the natural system, and to complete their diagnosis. The researches which I have just completed upon the *Rhinanthaceæ*, an important family, the parasitism of which was not suspected before the interesting and unexpected observations of M. Decaisne †, bring in support of this opinion an amount of new facts, which, it seems to me, should attract the attention of those naturalists who take an interest in the means of perfecting the natural system, and especially that of those who occupy themselves with descriptive Botany.

As essential anatomical characters of the order *Rhinanthaceæ*, I shall indicate in the stem, the vessels never entirely united into bundles, and the want of the fibro-cortical system, or at least of cortical prosenchyma exterior to the fibrous tissue properly so called; in the rhizome, the constant existence of the organ itself, always anatomically determinable, the absence of true spiral vessels, and the vessels never approximated in groups; in the leaves, the epidermic cells which are always chromuliferous, although furnished with numerous stomata, and the vessels generally neither prismatic nor pressed together.

The natural anatomical character is completed by the habitual absence of medullary rays in the rhizome, and of the fibro-cortical body in the stem, by the medullary sheath and proper woody stratum not being confused, by the leaves with the epidermic cells almost always with sinuous side-walls, and with the parenchyma homogeneous towards the two faces; and, lastly, by the presence of capitate glands of 1 to 4, rarely 8 cells, as in many true *Scrophulariaceæ*.

The *Rhinanthaceæ* have very great affinities with non-parasitic plants not belonging to the same family. However, to the morphological characters which distinguish them from the *Scrophulariaceæ*, and which appeared to the illustrious Laurent de Jussieu sufficient for their separation, we must add their parasitism, the constant absence of medullary rays in the stems, and that of the fibro-cortical bundles.

The families of parasitic plants with which the *Rhinanthaceæ* have the most analogies, both anatomical and morphological, are the *Epirhizanthaceæ*, the *Orobancheæ*, and the *Monotropææ*.

* Translated from the Comptes Rendus de l'Académie des Sciences de Paris, 2nd March, 1857, p. 470.

† Comptes Rendus, 12th July, 1847.

Related to the *Orobanchæ* by their rhizome with wide medullary communications, by their epidermis with subhexagonal cells containing oleo-resinous drops, by their squamiform leaves with a homogeneous parenchyma, and the vessels crowded into a bundle in the axis of the nervures, the *Epirhizanthaceæ* approach very closely to the *Rhinanthaceæ* by the similarity of the vessels and fibres in the stem and rhizome.

To the morphological differences, considerable as they are, which separate the *Rhinanthaceæ* from the *Orobanchæ*, we have to add some anatomical facts, which acquire great value from their constancy and general occurrence: such are the rhizome, constantly destitute of medullary rays, and with its vessels never grouped; the stem with a scattered vascular system and a distinct medullary sheath; the leaves with numerous stomata, with green matter, with the parenchyma sometimes heterogeneous, and the vessels distinct from one another.

The *Orobanchæ* have numerous morphological affinities with the *Rhinanthaceæ*, which would be sought for in vain between them and the *Monotropeæ*; but nevertheless it is with the latter, which, like them, are more completely parasitic than the *Rhinanthaceæ*, that they present the greatest number of anatomical relations; so true is it that the structure of organized beings stands in necessary relations with their mode of life.

Each of the genera of the *Rhinanthaceæ* has its anatomical, as well as its floral characters. *Castilleja*, like *Obolaria*, has the medullary sheath scarcely, if at all, distinct; but its stem is provided with a fibro-cortical ring, and often with feculiferous fibre-cells. *Schalbea* differs from *Castilleja* by its vessels arranged in radiating lines in the stem, and by its irregularly folded epidermic cells. The *Bartsiaæ* are destitute of the fibro-cortical system, and have the medullary sheath distinct. *Odontites* and *Euphrasia*, which have but little morphological distinction, are confounded by their anatomy. *Cymbaria* is well characterized by its vessels being frequently approximated by twos and threes in the rhizome, and all placed in radiating lines in the stem, by its fibro-cortical layer, and by its thick pitted fibres which enter into the bundles of the leaves. *Rhynchocorys*, recently separated from *Rhinanthus* by the morphologists, is a genus which is admitted by anatomy, as the spiral vessels of the sheath are not arranged upon the lines of the pitted rayed vessels of the woody layer, and as in the leaves the vessels are isolated from each other, at the same time that the parenchyma is homogeneous throughout its thickness. *Pedicularis*, a numerous genus, the species of which present considerable floral differences, exhibits no more uniformity in its anatomy than in its morphology. We may, however, regard as its general cha-

acters: the great development of the perforating cone and the existence of fibroid strengthening folds in the suckers; in the stem the constantly distinct medullary sheath and the pitted utricles of the pith; and in the leaves the thick pitted fibres, and the epidermis and parenchyma often heterogeneous. *Melampyrum* has the perforating cone of the suckers well organized, but destitute of strengthening folds, the medullary sheath not distinct from the concentric woody layer, and, by an exception to the character of the order, which occurs, however, also in *Rhinanthus*, it has the vessels of its leaves grouped as in the *Orobanchæ*, amongst which it corresponds exactly with *Phelipæa*. Lastly, *Tozzia*, which is morphologically very nearly allied to *Melampyrum*, is well distinguished therefrom by its leaves with the vessels neither pressed together nor prismatic, and the parenchyma homogeneous, as well as the epidermis, towards the two faces of the limb.

The anatomy, which is not favourable to the splitting of the genus *Bartsia* into *Eufragia* and *Trixago*, separates very distinctly some species which there is great difficulty in distinguishing morphologically. The *Odontites Jaubertiana*, which has been, until very recently, confounded with *O. rubra*, even at the gates of Paris, differs considerably from the latter in the structure of its leaves and medullary sheath. In the same way also the *Euphrasia paludosa* and *E. speciosa* of R. Brown, which the learned Bentham appears inclined to unite as simple varieties, must remain separated; the latter species differing greatly from the other by the form of its epidermic cells, which is rare even in the order.

With these examples I conclude, as I only wish to show here that botanists might have recourse to anatomy with good results, even in the determination of the value of critical species.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

June 24, 1856.—Dr. Gray, F.R.S., in the Chair.

ON THREE GENERA OF VESPERTILIONIDÆ, FURIPTERUS, NATALUS AND HYONYCTERIS, WITH THE DESCRIPTIONS OF TWO NEW SPECIES. BY ROBERT F. TOMES.

The genus *Furia* was established by M. F. Cuvier from the examination of a single example taken at Mona in South America, by M. Leschenault.

Linnaeus having previously made use of the name in another branch